

Pinon Ridge Mining LLC
31161 Hwy 90
P.O. Box 825
Nucla, CO 81424

March 9, 2020

Attn: Michael Stovern
U.S. EPA, Region 8 (8ENF-AT)
1595 Wynkoop Street
Denver, CO 80202-1129

Subject: Pinon Ridge Mining LLC, Sunday Mines Complex, 40 CFR 61 Subpart B 2019 Annual Compliance Report

Dear Mr. Stovern:

Enclosed are two copies of the Pinon Ridge Mining LLC ("Pinon Ridge") 2019 annual compliance report for the Sunday Mines Complex. The compliance report demonstrates compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Underground Uranium Mines (40 CFR 61, Subpart B). The Mine is located on the north side of Gypsum Ridge in San Miguel County, Colorado, and includes the Sunday, West Sunday, Carnation, St Jude, and Topaz mines within the same mine complex.

The Sunday Mines Complex is an underground vanadium/uranium mine complex which is expected to produce over 100,000 tons of ore during the life of the mine and has a potential annual ore production rate greater than 10,000 tons. Therefore, the Mine is subject to the NESHAP for Underground Uranium Mines. Pinon Ridge is submitting this annual compliance report for the Mine as required under the rule.

In 2019, mining activities were conducted at portions of the Mine from June 9 through September 9. During this time, radon emissions were measured at the mine vents and the annual emissions were modeled to evaluate compliance with the effective dose equivalent limit of 10 millirems per year ("mrem/yr"). The maximum modeled dose for the maximally-exposed individual was 0.2 mrem/yr which is well below the 10 mrem/yr limit. The enclosed report provides details of the modeling analysis and all information required as part of the submittal.

Please contact me (435-459-1354, mrutter@western-uranium.com) with any questions or comments.

Sincerely,



Michael Rutter
Vice President, Operations

cc: George Glasier, Pinon Ridge Mining, LLC
Frank Filas, Filas Engineering

**PINON RIDGE MINING LLC
40 CODE OF FEDERAL REGULATIONS 61 SUBPART B**

SUNDAY MINES COMPLEX

2019 ANNUAL COMPLIANCE REPORT

MARCH 2020



**Pinon Ridge Mining LLC
31161 Highway 90
PO Box 825
Nucla, CO 81424**

Name and Location of the Mine:

Pinon Ridge Mining LLC (Pinon Ridge) operates the Sunday Mines Complex (the “Mine”), located on the north side of Gypsum Ridge in San Miguel County, Colorado, which includes the Sunday, West Sunday, Carnation, St Jude, and Topaz mines within the same mine complex. The Mine site is generally located at Universal Transverse Mercator (UTM) coordinates 691,300 meters (m) east and 4,216,600 m north (North American Datum [NAD] 83).

Pinon Ridge is the operator of the Mine, an underground vanadium/uranium mine complex which is expected to produce over 100,000 tons of ore during the life of the mine and has a potential annual ore production rate greater than 10,000 tons. Pinon Ridge is submitting this annual compliance report for the Mine pursuant to the requirements in Code of Federal Regulations (CFR) 40 Part 61, Subpart B – National Emissions Standards for Hazardous Air Pollutants.

In 2019, mining activities were conducted at portions of the Mine from June 9 through September 9 (the “Operational Period”). During this period, exploration activities occurred, including the mining of a large bulk sample used for metallurgical testing. After September 9, 2019, mine ventilation ceased for the remainder of the year. As a result, the modeling referred to herein is limited to the Operational Period. The Mine is expected to resume mine ventilation during the 2020 calendar year.

Name of the Person Responsible for Operation and Preparer of Report:

Michael Rutter
Phone: 435-459-1354

Pinon Ridge Mining LLC
31161 Highway 90
PO Box 825
Nucla, CO 81424

Model Used to Determine Compliance with Emission Standards:

Under 40 CFR 61.22, emissions of radon-222 to the ambient air from an underground uranium mine shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent (“dose”) of 10 millirems per year (“mrem/yr”). Further, 40 CFR 61.23(a) provides that compliance with this emission standard shall be determined and the effective dose equivalent calculated by the U.S. Environmental Protection Agency (“EPA”) computer code COMPLY-R.

Pinon Ridge engaged CTEH LLC (CTEH) to calculate the effective dose equivalent for radon-222 using the EPA COMPLY-R computer model. CTEH issued a report entitled *Effective Dose Equivalent Estimation: Comply-R Modeling* for the Sunday Mines Complex, dated February 2020. A copy of this report is included as Attachment A.

Results of the Emissions Testing and Dose Calculation:

Testing for radon-222 from the vent shafts and other emission sources at the Mine was completed in accordance with 40 CFR 61, Appendix B, Method 115, Section 1 (“Radon-222 emissions from Underground Uranium Mine Vents”). Specifically, Pinon Ridge measured radon-222 emissions per Sections 1.1.1 (“Continuous Measurement”) and 1.2 (“Test Methods and Procedures”).

Section 1.1.1 specifies that the radon-222 concentration shall be continuously measured at each mine vent whenever the mine ventilation system is operational. Radon-222 emission rates were calculated and recorded utilizing monthly radon-222 concentration data and ventilation rate measurements.

Pinon Ridge used Method A-7 to analyze radon-222 and used commercially available, alpha track radon-222 detectors to continuously collect radon-222 emissions on a monthly basis during the Operational Period. The results of the emission testing are provided in Attachment B.

The modeled results for the Mine are included with the CTEH Report in Attachment A. The modeled results show a total dose of 0.2 mrem/yr to the maximally exposed receptor, from the combined individual doses calculated for each vent. The calculated dose of 0.2 mrem/yr is less than the 10 mrem/yr standard set out in 40 CFR 61.22. The COMPLY-R default inputs for air temperature and vent temperature were used in calculating this dose. The wind speed and direction data used as an input for the COMPLY-R modeling were taken from the National Weather Service Station at Grand Junction Colorado.

List of Ventilation:

The Mine features and user-supplied model input parameters are included in the CTEH report in Attachment A. In 2019, mining activities were conducted during the Operational Period only. After the Operational Period, no workers entered the Mine, all fans were turned off, and ventilation to “allow workers to enter the Mine” ceased. All emissions during the Operational Period from Mine vents were included in the modeling. During the Operational Period, the emission sources at the Mine were the Sunday #1 vent, the Sunday #7 vent, the West Sunday #1 vent, and the West Sunday #2 vent. All other potential emission sources at the Mine were either inactive or downcast throughout the Operational Period and therefore determined to be non-emitting.

Description of Effluent Controls:

Effluent control is based on the duration of work conducted underground, and the length of time the ventilation fans were operated during the Operational Period. Not all vents for the Mine were exhausting continuously and some vents were used to pull fresh air into the Mine (downcast). Radon was tested and modeled only for air emissions and not for downcast mine vents. During the Operational Period, the fans exhausted 24 hours per day, 7-days per week. The non-emitting ventilation features were observed to be forced downcast or naturally downcast during the Operational Period.

Distances from Points of Release to the Nearest Residence, School, or Business or Office:

Distance information is provided in the computer reports and on input tables for the model inputs. Distances are calculated based upon individual mine map coordinate systems. The nearest residence is at a distance of 4,689 meters to the nearest active exhaust vent. The details of receptors and distances from the Mine are provided in the CTEH report given in Attachment A.

Distances from nearest farm producing vegetables, milk and meat:

The nearest residence is located 4,689 meters from the nearest exhausting Mine vent. There are no farms producing vegetables or milk in the vicinity. There are cattle grazing from time to time on nearby range land.

Values used for other user-supplied input parameters:

Choice of Meteorological Data

Meteorological data (wind direction and speed) from the National Weather Service Station at Grand Junction, Colorado were used for the attached COMPLY-R modeling. The Grand Junction dataset was determined to be the most representative available dataset for the Sunday Mines Complex. While other meteorological stations are closer to the Mine, the wind conditions from the Grand Junction station more closely matches the site's wind conditions (see CTEH report for further details).

Determination of Receptors

Since actual wind rose data were used for the attached modeling, the COMPLY-R model requires that the nearest potential receptors must be identified in each of the sixteen directions of the compass relative to each of the Mine vents.

These potential receptors were determined based on a careful review of satellite imagery, in conjunction with Pinon Ridge's knowledge of the surrounding areas. In many cases, the closest identified structure in a given direction may not be occupied but was included as a receptor in the modeling to identify the worst-case modeled impacts. It is likely that some of the possible receptors that have been identified are not actual receptors (e.g., they are uninhabited structures). Pinon Ridge may update its receptors from time to time if field investigations warrant.

The potential receptors used in the attached COMPLY-R modeling, along with other user supplied input parameters, are provided in the CTEH Report (Attachment A).

Certification

"I Certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. See 18, U.S.C. 1001."

Signed: Michael R. Rutter
Michael Rutter
Vice President, Operations

Date: 3/9/2020

ATTACHMENT A
CTEH REPORT



THE SCIENCE OF READYSM

EFFECTIVE DOSE EQUIVALENT ESTIMATION: COMPLY-R MODELING PINON RIDGE MINING LLC SUNDAY MINES COMPLEX

Prepared for:

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Prepared by:

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March 2020
Project #112217

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1.0 Introduction

Pinon Ridge Mining LLC (Pinon Ridge) operates the Sunday Mines Complex (the “Mine”) located on the south side of Big Gypsum Valley in San Miguel County, Colorado, 17 miles southwest of Naturita, Colorado (Figure 1-1). The Mine produces vanadium and uranium ore which is subsequently transported offsite for processing. Western Uranium & Vanadium Corporation (parent company to Pinon Ridge) acquired the Sunday Mines Complex from Energy Fuels Inc. in 2014.

As part of the air quality permit, the Mine is required to annually demonstrate compliance with a radon dose modeling evaluation which is required under the U.S. Environmental Protection Agency’s (EPA’s) National Emission Standards for Hazardous Air Pollutants (NESHAPS), Subpart B. The modeling was completed using the EPA regulatory model, COMPLY-R, which estimates transport/dispersion of radon from the mine vents/portals, followed by an estimated dose to members of the public. This report provides the 2019 compliance demonstration for the Sunday Mines Complex and includes a description of the mining operations, modeling methodology, and the modeling results.

1.1 Sunday Mines Complex Description

The Sunday Mines Complex consists of five mine portal areas: Topaz, Sunday, West Sunday, Carnation, and St. Jude. The underground mine was ventilated from June 9 through September 9 in 2019. The maximum potential ore production rate is 214,000 tons per year (tpy) of uranium and vanadium ore from all mine areas.

No ore is processed onsite. Instead, ore is transported offsite for processing. Sources of air pollutant emissions associated with the Mine include vent shafts, ore and rock storage and handling, vehicle travel, and other fugitive emissions. During 2019, the Mine had limited operation with two active portals and five active vent shafts. Of these, four vent shafts had upcast flow. The portals and vent shafts that were active at the Mine in 2019 are shown in Figure 1-2.

1.2 Air Quality Regulatory Framework

Based on the uranium ore production potential being greater than 100,000 tons of ore during the Mine’s life, it is subject to Subpart B of the NESHAP (Underground Uranium Mine NESHAP) which is listed in the Code of Federal Regulations (CFR) Part 61, Subpart B. As prescribed by 40 CFR 61, Subpart B, Pinon Ridge is required to conduct radon-222 testing in accordance with the procedures described in the rule during the time the mine is active. According to §61.21(a) of the rule, a mine is considered “active” whenever the mine is being ventilated to allow workers to enter the mine for any purpose. The rule specifies that the radon-222 concentration shall be continuously measured at each mine vent whenever the mine ventilation system is operational. Additionally, each mine vent exhaust flow rate must be measured at least four (4) times per year.

Figure 1-1 Sunday Mines Complex, Location Map

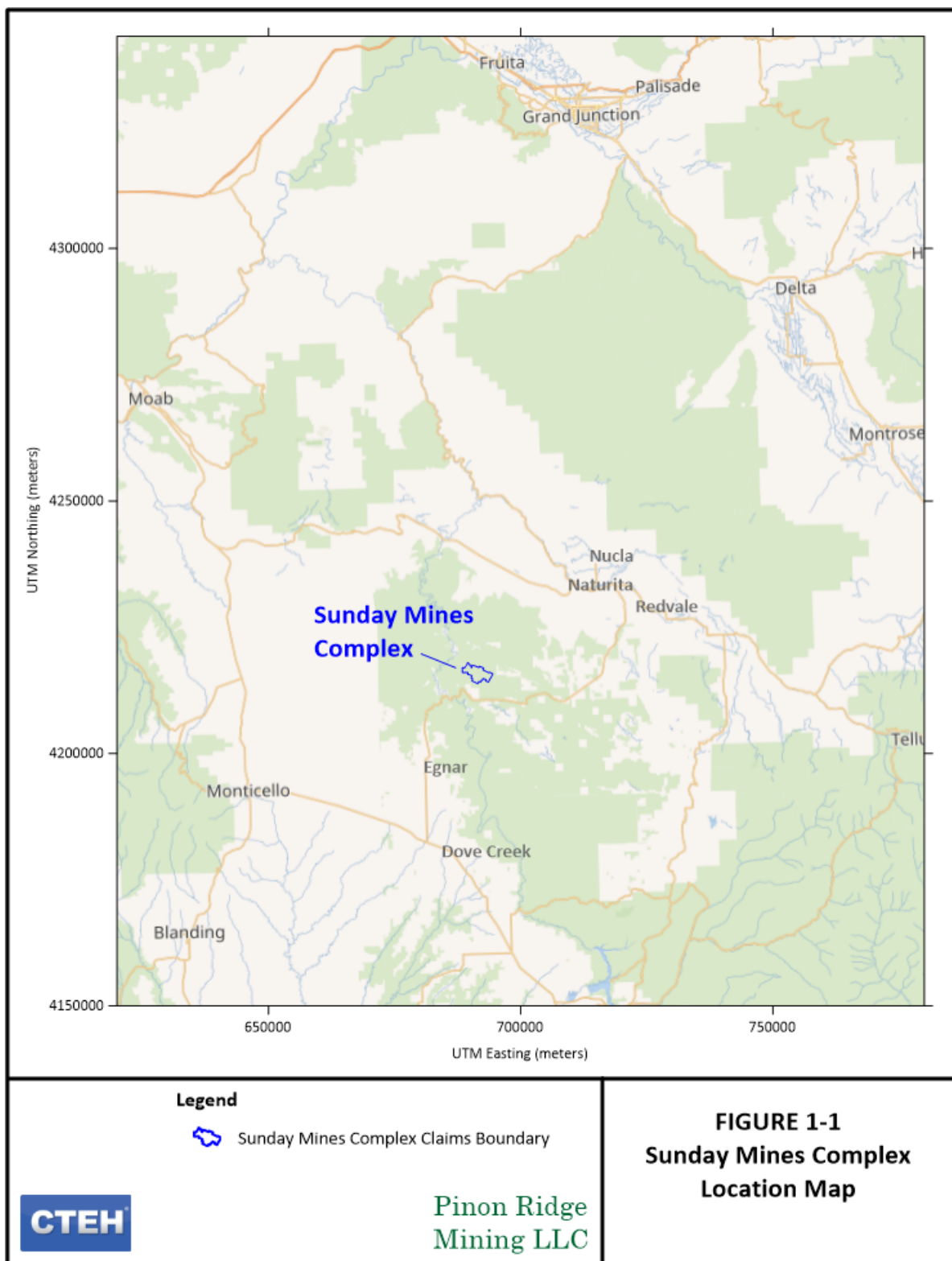
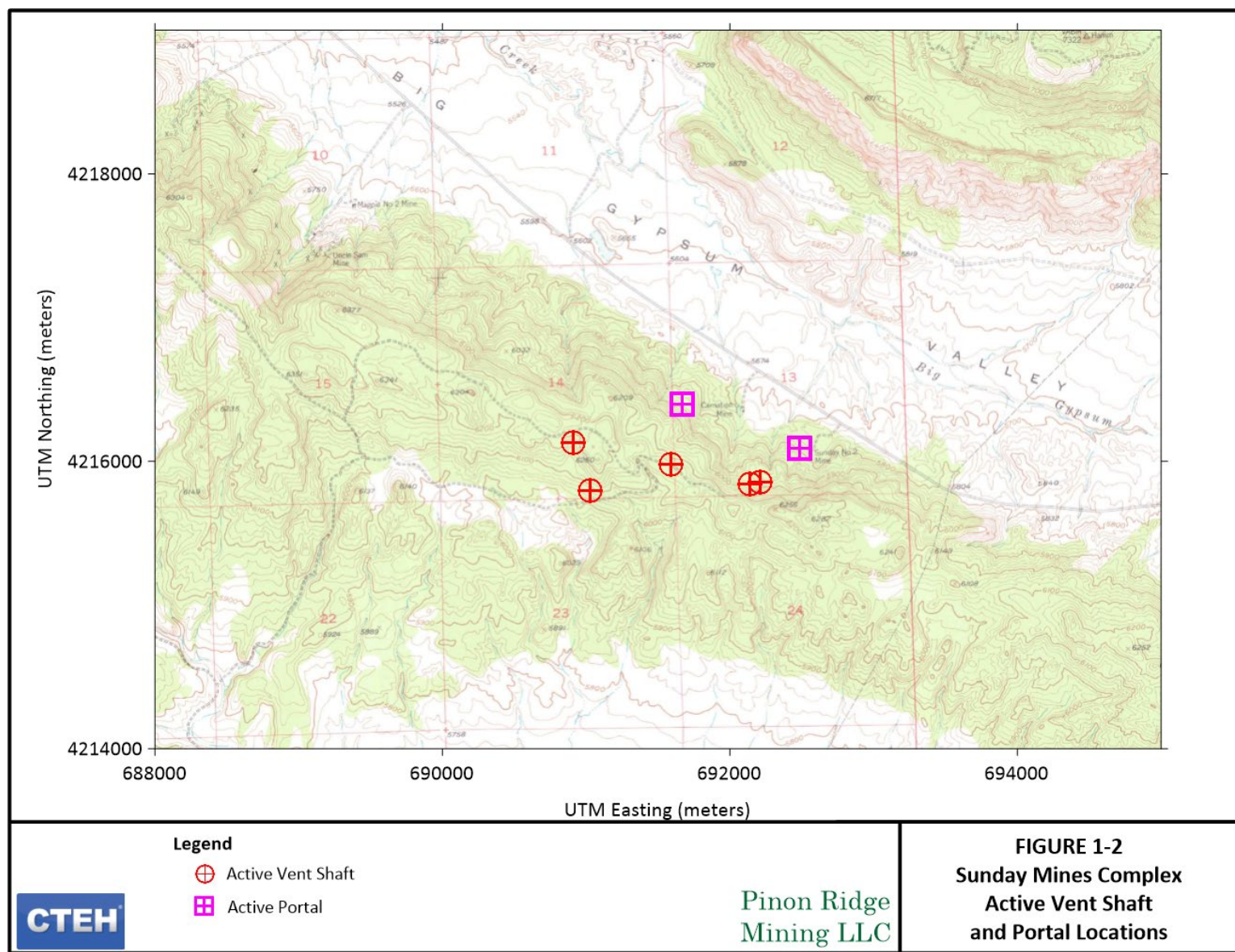


Figure 1-2 Sunday Mines Complex, Active Vent Shaft and Portal Locations



The resulting radon-222 concentration and flow rate measurements are then used to calculate the effective dose equivalent resulting from mine emissions. Specifically, emissions of radon-222 to the ambient air from an underground uranium mine shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 millirem per year (mrem/yr). In accordance with §61.23(a) of the rule, the EPA computer code COMPLY-R shall be used to calculate an effective dose equivalent. An equivalent computer model may also be used provided that the model has received prior approval from EPA headquarters. For this analysis at the Sunday Mines Complex, the COMPLY-R model is used in accordance with the model's User's Guide (EPA 1989).

2.0 Modeling Methodology

The COMPLY-R model was developed to evaluate compliance with the radon-222 dose limits for underground uranium mines (40 CFR Part 61, Subpart B). The model uses simplified Gaussian dispersion algorithms to estimate downwind transport and dispersion of mine vent effluent. This simplified approach eases input requirements for the modeling simulation, but also introduces limitations in the model results. For example, COMPLY-R does not address complex terrain or changes in elevation. For this model analysis, the EPA-recommended default model values have been applied to the model, which likely produces highly conservative model results that overestimate radon-222 concentrations.

2.1 Source Input Data

The Sunday Mine complex is composed of several mine areas spread over a broad area. The COMPLY-R model requires input of vent characteristics for all active vents and portals over the modeling period. Table 2-1 shows all mine vents/portals at the Sunday Mines Complex and Table 2-2 show only those vents/portals that were active during 2019, along with location, size, height, flow, and emission data for each vent. The COMPLY-R default inputs for air temperature (temperature assumption) and vent temperature (55 °F) were used in the model. The vents listed in Table 2-2 were active only during the months June-September in 2019. Note that vents/portals have either upcast or downcast airflow and only upcast flows represent conditions that would result in radon emissions to the atmosphere. For any vent/portal in Table 2-2, if upcast conditions existed at any time during 2019, it is listed as upcast and emission calculations are provided. Figure 1-2 shows a plot of the active mine vents/portals during 2019.

TABLE 2-1 SUNDAY MINES COMPLEX, NAMES AND LOCATIONS OF ALL VENTS AND PORTALS

Source Name	COMPLY-R Name	Easting (m)	Northing (m)
Carnation Portal	S1	692118.5	4216104.4
GNG Portal	S2	693250.2	4215892.8
Old Carnation Shaft	S3	692080.5	4216322.9
St. Jude No. 1	S4	691592.0	4215976.1
St. Jude No. 2	S5	691481.4	4215836.6
St. Jude Portal	S6	691668.4	4216396.8
Sunday No. 9	S7	692603.8	4215606.3
Sunday No. 1	S8	692141.8	4215843.1
Sunday No. 11	S9	692478.3	4216137.5
Sunday No. 15	S10	691793.5	4215524.9
Sunday No. 2	S11	692425.3	4216138.9
Sunday No. 3	S12	692106.7	4215692.5
Sunday No. 4	S13	691717.3	4215336.0
Sunday No. 7	S14	692213.8	4215854.7
Sunday No. 8	S15	691721.4	4215125.5
Sunday Portal	S16	692485.0	4216089.8
Topaz No. 1	S17	689706.8	4216801.9
Topaz No. 2	S18	689757.3	4216235.1
Topaz Portal	S19	689567.4	4217555.8
Unknown	S20	692022.6	4216329.6
Unknown	S21	691806.6	4216346.3
West Sunday Portal	S22	691050.9	4216902.1
West Sunday No. 1	S23	690908.3	4216126.9
West Sunday No. 2	S24	691028.2	4215792.8
West Sunday No. 3	S25	690502.2	4215882.9
Carnation Portal	S1	692118.5	4216104.4
GNG Portal	S2	693250.2	4215892.8
Old Carnation Shaft	S3	692080.5	4216322.9
St. Jude No. 1	S4	691592.0	4215976.1
St. Jude No. 2	S5	691481.4	4215836.6
St. Jude Portal	S6	691668.4	4216396.8
Sunday No. 9	S7	692603.8	4215606.3

Table 2-2 Sunday Mines Complex, Active Vent/Portal Characteristics

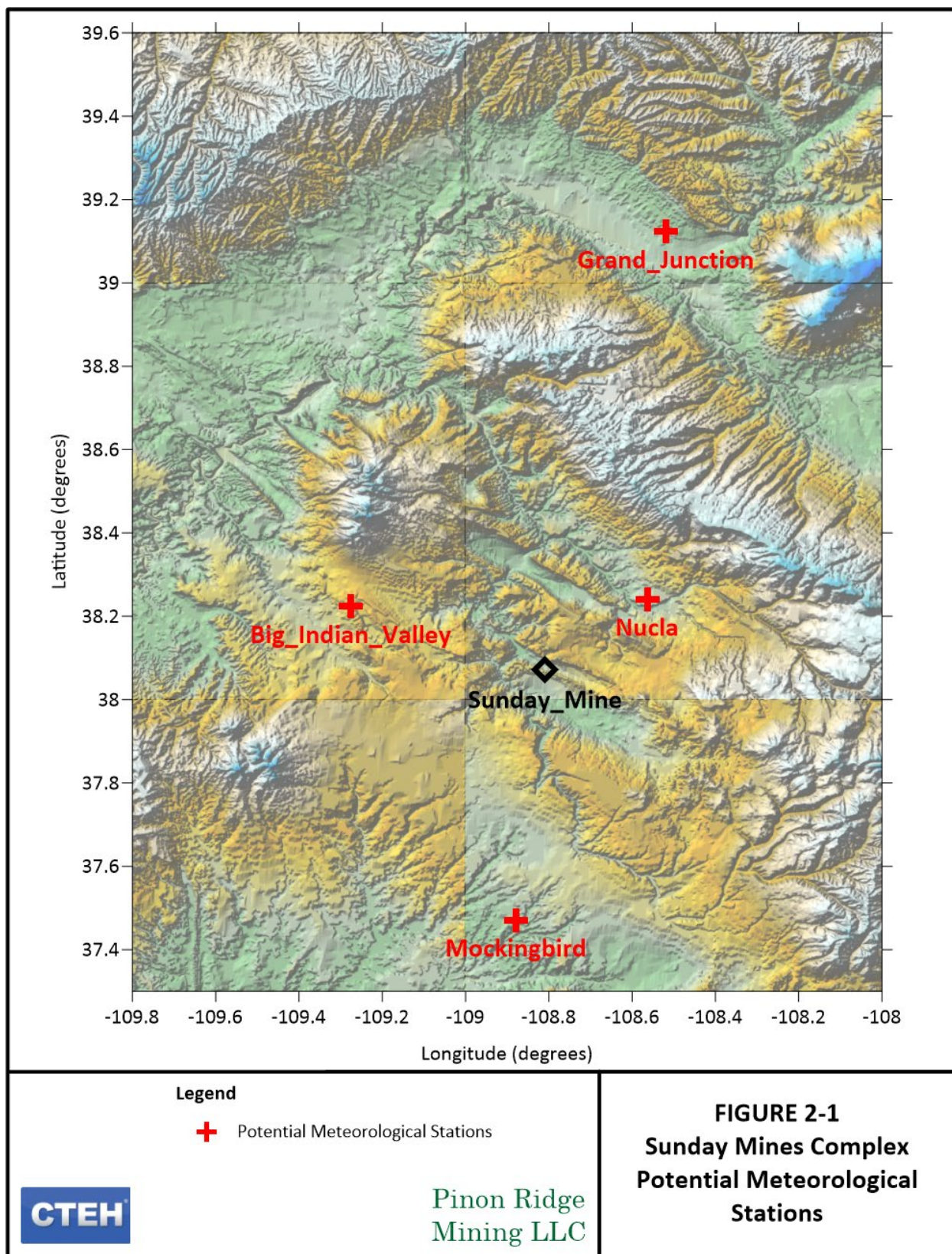
Source Name	COMPLY-R Name	Elevation (m)	Effective Diameter (m)	Release Height (m)	Upcast or Downcast Flow	Average Weighted Flow (m ³ /s)	2010 Emission (Ci/yr)
St Jude No. 1	S4	1878.5	3.11	0.0	Downcast	0.0	0.0
St Jude Portal	S6	1787.4	3.44	0.0	Downcast	0.0	0.0
Sunday No. 1	S8	1821.0	1.83	0.91	Upcast	10.3	297.4
Sunday No. 7	S14	1818.9	1.52	2.29	Upcast	7.0	1.1
Sunday Portal	S16	1759.5	3.11	0.00	Downcast	0.0	0.0
West Sunday No. 1	S23	1882.4	1.62	1.04	Upcast	13.6	59.8
West Sunday No. 2	S24	1852.6	1.62	1.04	Upcast	9.5	5.6

2.2 Meteorological Data

The COMPLY-R model includes the option for using frequency distribution data of wind speeds and wind directions to characterize dispersion. The wind data should be from a nearby meteorological station that is representative of wind conditions at the mine site. These data are often presented graphically in a wind rose and the data are input into the COMPLY-R model prior to executing the model run. Appendix D of the COMPLY-R User's Guide (EPA 1989) describes the suitability of wind rose data for use in the modeling analysis. The key factors that most affect wind speed and direction, and thus the representativeness of the dataset, are the elevation relative to the surrounding area, presence of a valley, presence of a large water body, topography, and whether the area is urban or rural.

Several meteorological stations have been considered for use in past COMPLY-R analyses for the Sunday Mines Complex. These stations include Grand Junction, Nucla, Mockingbird Mesa, and Big Indian Valley Utah. Figure 2-1 shows the location of each meteorological station relative to the Mine site, overlaid on a topographical color relief basemap. Generally, all meteorological stations considered are in rural environments and none are affected by a large water body. Thus, the primary considerations for comparison with the Mine site are the topography, terrain, and the elevation of the stations compared to the mine site. The meteorological dataset that is most representative of conditions at the Sunday Mines Complex was determined to be Grand Junction. While Nucla is the closest station, its wind directions demonstrate significant influence from three valleys and does not represent conditions at the Mine. A review of currently available meteorological data was completed for this analysis and no new datasets were identified that are suitable for use in the modeling. Therefore, an updated five-year Grand Junction

Figure 2-1 Sunday Mines Complex, Potential Meteorological Stations

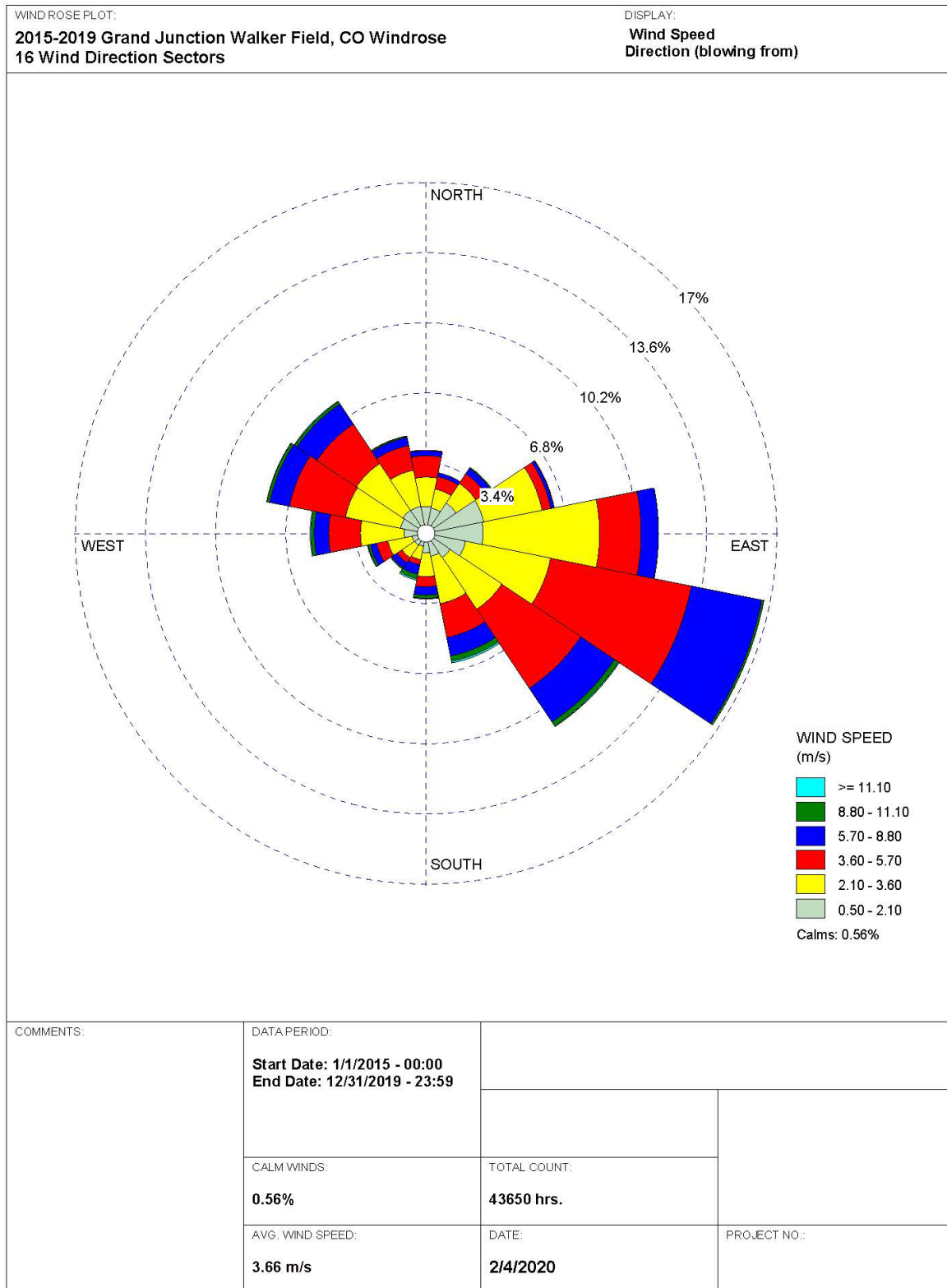


dataset from the years 2015-2019 was used for the modeling. The selection of Grand Junction meteorological data is also consistent with the recommendation by the Colorado Department of Public Health and Environment (CDPHE) to use Grand Junction data for dispersion modeling associated with minor source permitting for the Mine (CDPHE 2007). A windrose plot of the 2015-2019 Grand Junction meteorological dataset is given as Figure 2-2. The plot shows the predominant up-valley/down-valley wind directionality within the Grand Junction valley, which is consistent with the valley alignment at the Sunday Mines Complex.

2.3 Model Receptors

Model receptors are locations where the model calculates radon-222 air concentrations and the associated dose to a person residing at that location. COMPLY-R requires one receptor to be input for each of 16 directional sectors that represents the closest receptor to the Mine vents in each direction. Each direction sector represents 22.5 degrees. Because the Mine is located in a remote location, few actual potential receptors exist in close proximity to the mine vents. The closest receptor identified is a structure located 4.5 to 5 miles south of the mine vents. Receptors identified in other direction sectors include known ranch houses, other structures that could be occupied, and the towns of Naturita, Slick Rock, Bedrock, and Egnar. For two of the direction sectors, there were no known receptors within approximately 30 miles. For these two direction sectors (North and West), receptors were placed at large distances from the Mine (30 miles), as recommended by COMPLY-R. The Universal Transverse Mercator (UTM) locations and elevations of the model receptors and distances to each vent were input to the model for processing. Figure 2-3 shows the locations of the model receptors relative to the active mine vents and nearby roads and towns. Table 2-3 lists the selected receptors for each direction, along with the UTM coordinates of each receptor. The calculated vent-receptor distances are shown in Table 2-4.

Figure 2-2 Grand Junction Walker Field 2015-2019 Windrose



WRPLOT View - Lakes Environmental Software

Figure 2-3 Sunday Mines Complex, Model Receptor Locations

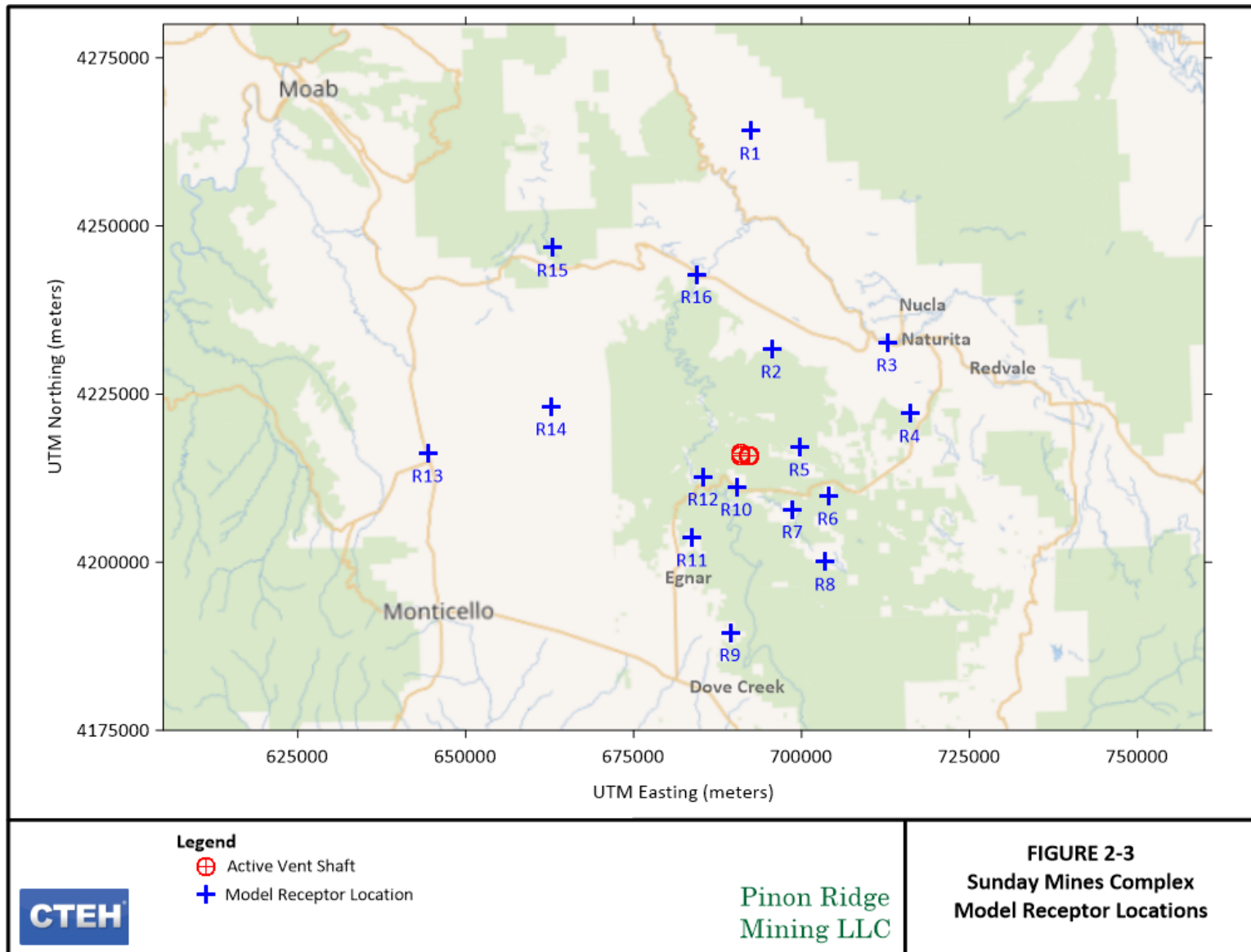


Table 2-3 Sunday Mines Complex, Model Receptor Locations

Receptor Number	Description	UTM East (m)	UTM North (m)	Elevation (m)
R1	Receptor 1 - N48	692425.3	4264138.9	1751.8
R2	Possible Receptor 2	695581.5	4231660.9	2109.7
R3	Possible Receptor 3	712785.8	4232633.9	1702.0
R4	Possible Receptor 4	716170.1	4222079.2	2095.6
R5	Possible Receptor 5	699755.1	4217093.7	2077.9
R6	Possible Receptor 6	703987.6	4209795.4	1962.2
R7	Possible Receptor 7	698715.2	4207829.6	1752.5
R8	Possible Receptor 8	703578	4200040	1817.0
R9	Possible Receptor 9	689429.4	4189535	2329.8
R10	Possible Receptor 10	690351.4	4211153.3	1718.9
R11	Possible Receptor 11	683772.5	4203645.7	2262.1
R12	Possible Receptor 12	685417.3	4212671	1706.8
R13	Receptor 13 - W48	644425.3	4216138.9	1837.7
R14	Possible Receptor 14	662812.5	4223113.6	1996.3
R15	Possible Receptor 15	663024.1	4246760.1	2276.9
R16	Possible Receptor 16	684415.4	4242778.8	1519.7

Table 2-4 - Sunday Mines Complex, Mine Vent - Receptor Distances

Vent Name	Comply-R Vent ID	UTM Coordinates		Distance to Receptor (Kilometers)															
		East (meters)	North (meters)	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16
		Direction Toward Receptor:		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Carnation Portal	S1	692118.5	4216104.4	48.035	15.937	26.464	24.783	7.700	13.442	10.582	19.733	26.705	5.257	14.996	7.530	47.693	30.133	42.264	27.764
GNG Portal	S2	693250.2	4215892.8	48.253	15.940	25.727	23.740	6.615	12.348	9.741	18.920	26.633	5.556	15.486	8.470	48.826	31.282	43.202	28.300
Old Carnation Shaft	S3	692080.5	4216322.9	47.817	15.732	26.358	24.768	7.713	13.579	10.778	19.933	26.919	5.451	15.157	7.598	47.656	30.045	42.080	27.544
St. Jude No. 1	S4	691592.0	4215976.1	48.170	16.184	26.957	25.325	8.239	13.851	10.822	19.940	26.529	4.980	14.601	7.004	47.167	29.651	41.997	27.747
St. Jude No. 2	S5	691481.4	4215836.6	48.312	16.347	27.130	25.466	8.369	13.889	10.791	19.896	26.382	4.818	14.424	6.841	47.057	29.578	42.025	27.853
St. Jude Portal	S6	691668.4	4216396.8	47.748	15.758	26.638	25.152	8.117	13.976	11.093	20.233	26.955	5.406	14.998	7.277	47.244	29.627	41.742	27.361
Sunday No. 9	S7	692603.8	4215606.3	48.533	16.328	26.406	24.439	7.304	12.781	9.891	19.046	26.264	4.990	14.868	7.763	48.181	30.723	42.959	28.379
Sunday No. 1	S8	692141.8	4215843.1	48.297	16.187	26.610	24.824	7.715	13.300	10.365	19.507	26.448	5.020	14.793	7.435	47.717	30.217	42.470	28.022
Sunday No. 11	S9	692478.3	4216137.5	48.001	15.831	26.163	24.426	7.339	13.141	10.388	19.553	26.777	5.419	15.226	7.866	48.053	30.475	42.489	27.835
Sunday No. 15	S10	691793.5	4215524.9	48.618	16.575	27.081	25.242	8.115	13.473	10.350	19.459	26.097	4.603	14.334	6.986	47.372	29.958	42.465	28.235
Sunday No. 2	S11	692425.3	4216138.9	48.000	15.840	26.204	24.477	7.392	13.188	10.421	19.585	26.772	5.400	15.197	7.819	48.000	30.423	42.451	27.818
Sunday No. 3	S12	692106.7	4215692.5	48.447	16.342	26.733	24.897	7.776	13.264	10.271	19.406	26.294	4.867	14.649	7.340	47.683	30.220	42.556	28.157
Sunday No. 4	S13	691717.3	4215336.0	48.808	16.776	27.260	25.366	8.228	13.463	10.262	19.356	25.902	4.400	14.134	6.840	47.299	29.933	42.553	28.398
Sunday No. 7	S14	692213.8	4215854.7	48.285	16.161	26.547	24.752	7.642	13.242	10.328	19.474	26.467	5.057	14.843	7.505	47.789	30.284	42.511	28.031
Sunday No. 8	S15	691721.4	4215125.5	49.018	16.980	27.391	25.418	8.271	13.374	10.107	19.187	25.693	4.202	13.963	6.765	47.307	29.992	42.712	28.602
Sunday Portal	S16	692485.0	4216089.8	48.049	15.876	26.188	24.431	7.339	13.112	10.346	19.510	26.730	5.378	15.191	7.851	48.060	30.492	42.528	27.882
Topaz No. 1	S17	689706.8	4216801.9	47.415	15.978	27.987	26.984	10.053	15.907	12.714	21.757	27.268	5.685	14.433	5.955	45.286	27.625	40.118	26.510
Topaz No. 2	S18	689757.3	4216235.1	47.978	16.489	28.271	27.052	10.035	15.620	12.284	21.291	26.702	5.116	13.940	5.616	45.332	27.809	40.576	27.076
Topaz Portal	S19	689567.4	4217555.8	46.671	15.334	27.685	26.985	10.198	16.376	13.352	22.430	28.021	6.450	15.069	6.410	45.164	27.326	39.464	25.744
Unknown	S20	692022.6	4216329.6	47.811	15.739	26.400	24.823	7.770	13.633	10.819	19.972	26.920	5.439	15.131	7.551	47.598	29.988	42.035	27.521
Unknown	S21	691806.6	4216346.3	47.797	15.773	26.560	25.029	7.984	13.831	10.966	20.111	26.916	5.393	15.028	7.371	47.382	29.773	41.874	27.446
West Sunday Portal	S22	691050.9	4216902.1	47.257	15.439	26.831	25.647	8.706	14.760	11.877	21.006	27.415	5.791	15.123	7.046	46.632	28.913	40.951	26.714
West Sunday No. 1	S23	690908.3	4216126.9	48.036	16.222	27.406	25.954	8.899	14.531	11.393	20.477	26.633	5.005	14.377	6.488	46.483	28.951	41.424	27.431
West Sunday No. 2	S24	691028.2	4215792.8	48.366	16.508	27.514	25.916	8.823	14.280	11.068	20.141	26.306	4.689	14.149	6.421	46.604	29.150	41.752	27.784
West Sunday No. 3	S25	690502.2	4215882.9	48.294	16.575	27.877	26.405	9.332	14.796	11.503	20.542	26.370	4.732	13.966	6.014	46.078	28.618	41.333	27.576

3.0 Model Results

The COMPLY-R model was run with all active mine vents and all 16 model receptors which represent potential members of the public. Because COMPLY-R produces only one maximum modeled value as output, it was run separately for each of the 16 model receptors so that a modeled value could be determined at each receptor location. The mine vents were actively ventilating June 9-September 9 only. This was accounted for in the radon-222 emission rates by using annual averaged values at each mine vent. Annual averages were calculated by averaging measured radon-222 emissions for each vent over the calendar year. Weeks when no mine ventilation occurred were calculated as zero emissions. Meteorological data from the Grand Junction, CO windrose were also input to the model. Calculations of potential dose were made by COMPLY-R for the nearest receptors in the 16 directional sectors from the mine vents (see Figure 2-3).

At all locations, the modeled maximum radon-222 dose is far lower than the regulatory threshold value of 10 mrem/yr. The maximum annual dose was estimated to be 0.2 mrem/yr and occurred at receptor 12 (R12), located southwest of the Mine near Slick Rock, CO. The second-highest dose was estimated to be 0.1 mrem/yr at receptor 10 (R10) which is located south of the Mine along State Highway 141. Table 3-1 lists the modeled annual dose values for each modeled receptor. The model inputs and outputs for the COMPLY-R run for Receptor 12 (R12) are provided in Appendix A.

4.0 Conclusions

The analysis results and the dose estimates from the COMPLY-R model indicate that at all modeled locations, the maximum modeled dose due to radon-222 is far lower than the regulatory threshold value of 10 mrem/yr. The maximally exposed receptor (R12) was estimated at 0.2 mrem/year, using 2019 emissions. These results are likely overestimates of the radon-222 concentrations that would actually occur due to the conservative assumptions used in the dispersion model. The analysis results demonstrate that the operation of the Sunday Mines Complex during 2019 is within regulatory compliance for radon-222 emissions.

Table 3-1 - Radon Doses Estimated with COMPLY-R

Receptor Number	Description	Receptor Direction Sector from Mine Vents	Modeled Annual Dose (mrem/yr)
R1	Receptor 1 - N48	N	0.005
R2	Possible Receptor 2	NNE	0.012
R3	Possible Receptor 3	NE	0.007
R4	Possible Receptor 4	ENE	0.011
R5	Possible Receptor 5	E	0.088
R6	Possible Receptor 6	ESE	0.062
R7	Possible Receptor 7	SE	0.082
R8	Possible Receptor 8	SSE	0.028
R9	Possible Receptor 9	S	0.017
R10	Possible Receptor 10	SSW	0.100
R11	Possible Receptor 11	SW	0.039
R12	Possible Receptor 12	WSW	0.200
R13	Receptor 13 - W48	W	0.020
R14	Possible Receptor 14	WNW	0.041
R15	Possible Receptor 15	NW	0.017
R16	Possible Receptor 16	NNW	0.018

5.0 References

40 Code of Federal Regulations (CFR), Part 61, Subpart B - National Emission Standards for Radon Emissions from Underground Uranium Mines.

Colorado Department of Public Health and Environment (CDPHE). 2007. Electronic Mail from Chuck Machovec, CDPHE, to Melissa Weakley, Tetra Tech, Inc., Regarding Meteorological Data Determination. September 30.

U.S. Environmental Protection Agency (EPA). 1989. *User's Guide for the COMPLY-R Code (Revision 1)*. EPA 520/1-89-029. Office of Radiation Programs. October

Appendix A

COMPLY-R Output for Receptor R12

02/07/20 03:18

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH
THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS
FROM THE COMPLY-R CODE, VERSION 1.2

Prepared by:

Pinon Ridge Mining LLC
Sunday Mines Complex
17 miles SW of Naturita, CO

Michael Rutter
435-459-1354

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

02/07/20 03:18

Stack	Release Rate (curies/YEAR)
-----	-----
1	2.974E+02
2	1.100E+00
3	5.980E+01
4	5.600E+00

SITE DATA FOR VENT 1.

Release Height 0.91 meters.

Vertical momentum present for vent 1

Vent diameter 1.83 meters.

Volumetric flow rate is 10.300 cu m/sec.

STACK DISTANCES, FILE: s8r12.dat

DIR	Distance (meters)
---	-----
N	*****
NNE	*****
NE	*****
ENE	*****
E	*****
ESE	*****
SE	*****
SSE	*****
S	*****
SSW	*****
SW	*****
WSW	7440.0
W	*****
WNW	*****
NW	*****
NNW	*****

02/07/20 03:18

SITE DATA FOR VENT 2.

Release Height 2.29 meters.

Vertical momentum present for vent 2

Vent diameter 1.52 meters.

Volumetric flow rate is 7.000 cu m/sec.

STACK DISTANCES, FILE: sl4r12.dat

DIR	Distance (meters)
---	-----
N	*****
NNE	*****
NE	*****
ENE	*****
E	*****
ESE	*****
SE	*****
SSE	*****
S	*****
SSW	*****
SW	*****
WSW	7510.0
W	*****
WNW	*****
NW	*****
NNW	*****

SITE DATA FOR VENT 3.

Release Height 1.04 meters.

Vertical momentum present for vent 3

Vent diameter 1.62 meters.

Volumetric flow rate is 13.600 cu m/sec.

02/07/20 03:18

STACK DISTANCES, FILE: s23r12.dat

DIR	Distance (meters)
---	-----
N	*****
NNE	*****
NE	*****
ENE	*****
E	*****
ESE	*****
SE	*****
SSE	*****
S	*****
SSW	*****
SW	*****
WSW	6490.0
W	*****
WNW	*****
NW	*****
NNW	*****

SITE DATA FOR VENT 4.

Release Height 1.04 meters.

Vertical momentum present for vent 4

Vent diameter 1.62 meters.

Volumetric flow rate is 9.500 cu m/sec.

STACK DISTANCES, FILE: s24r12.dat

DIR	Distance (meters)
---	-----
N	*****
NNE	*****
NE	*****
ENE	*****
E	*****
ESE	*****
SE	*****
SSE	*****
S	*****
SSW	*****
SW	*****
WSW	6420.0
W	*****
WNW	*****
NW	*****
NNW	*****

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WINDROSE DATA, FILE: gj15-19w.dat

Source of wind rose data: Grand Junction Walker Field, CO 15-19
 Dates of coverage: 2015-2019
 Wind rose location: Grand Junction, CO
 Distance to facility: 74 miles

Percent calm: 0.01

Wind FROM -----	Frequency -----	Speed (meters/s) -----
N	0.040	3.10
NNE	0.030	2.85
NE	0.038	2.89
ENE	0.063	2.41
E	0.112	3.06
ESE	0.167	4.29
SE	0.112	4.27
SSE	0.064	4.09
S	0.032	3.65
SSW	0.023	4.51
SW	0.021	3.51
WSW	0.029	3.66
W	0.056	3.83
WNW	0.079	3.85
NW	0.077	3.89
NNW	0.048	3.29

NOTES:

Default air temperature used (55.0 degrees F).

Default vent temperature used (55.0 degrees F). Vent 1.

The receptor exposed to the highest concentration is located
 7440. meters to the WSW. Vent 1.

Default vent temperature used (55.0 degrees F). Vent 2.

The receptor exposed to the highest concentration is located
 7510. meters to the WSW. Vent 2.

Default vent temperature used (55.0 degrees F). Vent 3.

The receptor exposed to the highest concentration is located
 6490. meters to the WSW. Vent 3.

Default vent temperature used (55.0 degrees F). Vent 4.

The receptor exposed to the highest concentration is located
 6420. meters to the WSW. Vent 4.

02/07/20 03:18

Input parameters outside the "normal" range:

Distance from vent to receptor is unusually FAR.

RESULTS:

Effective dose equivalent: 0.2 (mrem/year).

Complies with emission standards.

*** This facility is in COMPLIANCE ***

***** END OF COMPLIANCE REPORT *****

ATTACHMENT B
EMISSIONS TESTING SUMMARY

SUNDAY MINES 2019 RADON MONITORING AND TRACKING

Concentration Exposure (pCi/L)																												
Sample Date	Vent Shape Vent Diameter (circular) or Length (Square) (ft)	Effective Diameter (ft)	Height (ft)	Vent Area (ft ²)	1/5/2019 - 6/15/2019	Radon Measurement 6/17/2019 7/16/2019	Days Measured	Upcast or Downcast	6/22/2019	6/29/2019	7/6/2019	7/13/2019	Radon Measurement 7/16/2019 8/17/2019	Days Measured	Upcast or Downcast	7/20/2019	7/27/2019	8/3/2019	8/10/2019	8/17/2019	8/24/2019	8/31/2019	9/7/2019	9/14/2019	9/21/2019 - 12/31/2019	Annual Average Concentration (pCi/L)		
Sunday Mines																												
St Jude Portal	square	10.0	11.3	0.0	100.0	Mine Fans/Operations shut down	59.1	28	Downcast	59.1	59.1	59.1	59.1	19.1	31	Downcast	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	19.1	Mine Fans/Operations shut down	7.9	
Sunday Portal	square	9.0	10.2	0.0	81.0		7.9	28	Downcast	7.9	7.9	7.9	7.9	12.3	31	Downcast	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3		2.7	
St. Jude Fan No. 1	square	9.0	10.2	0.0	81.0		522.0	28	Downcast	522.0	522.0	522.0	522.0	71.2	31	Downcast	71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.2		52.5	
Sunday Fan No. 1	circular	6.0	6.0	3.0	28.3		1011.0	27	Upcast	1011.0	1011.0	1011.0	1011.0	881.0	31	Upcast	881.0	881.0	881.0	881.0	881.0	881.0	881.0	881.0	881.0		230.3	
Sunday Fan No. 7	circular	5.0	5.0	7.5	19.6		2.1	24	Upcast	2.1	2.1	2.1	2.1	6.0	31	Upcast	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		1.2	
West Sunday No. 1	circular	5.3	5.3	3.4	22.3		259.0	24	Upcast	259.0	259.0	259.0	259.0	86.5	31	Upcast	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5	86.5		34.9	
West Sunday No. 2	circular	5.3	5.3	3.4	22.3			0	Upcast	0.0	0.0	0.0	0.0	27.2	16	Upcast	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2	27.2		4.7	

aValues are highlighted if they exceeded the max on the radon canister and the highest value on record for the year was used.

b Canister was damaged and no laboratory analysis was available. As a result the highest value on record for the year was used.

c Laboratory analysis indicated that the actual result was lower than the number provided; however, to be conservative that number was utilized.

Velocity (fpm)																												
Sample Date	Vent Shape	Vent Diameter (circular) or Length (Square) (ft)	Effective Diameter (ft)	Height (ft)	Vent Area (ft ²)	1/5/2019 - 6/15/2019	Velocity Measurement 8/29/2019			6/22/2019	6/29/2019	7/6/2019	7/13/2019	Velocity Measurement 8/29/2019			7/20/2019	7/27/2019	8/3/2019	8/10/2019	8/17/2019	8/24/2019	8/31/2019	9/7/2019	9/14/2019	9/21/2019 - 12/31/2019	Annual Average Velocity (fpm)	
Sunday Mines																												
St Jude Portal	square	10.0	11.3	0.0	100.0	Mine Fans/Operations shut down	0.0		Downcast	0.0	0.0	0.0	0.0	0.0		Downcast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Mine Fans/Operations shut down	0.0	
Sunday Portal	square	9.0	10.2	0.0	81.0		0.0		Downcast	0.0	0.0	0.0	0.0	0.0		Downcast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
St. Jude Fan No. 1	square	9.0	10.2	0.0	81.0		0.0		Downcast	0.0	0.0	0.0	0.0	0.0		Downcast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	
Sunday Fan No. 1	circular	6.0	6.0	3.0	28.3		3076.6		Upcast	3076.6	3076.6	3076.6	3076.6	3076.6		Upcast	3076.6	3076.6	3076.6	3076.6	3076.6	3076.6	3076.6	3076.6	3076.6		3076.6	769.2
Sunday Fan No. 7	circular	5.0	5.0	7.5	19.6		3019.2		Upcast	3019.2	3019.2	3019.2	3019.2	3019.2		Upcast	3019.2	3019.2	3019.2	3019.2	3019.2	3019.2	3019.2	3019.2	3019.2		3019.2	754.8
West Sunday No. 1	circular	5.3	5.3	3.4	22.3		5169.3		Upcast	5169.3	5169.3	5169.3	5169.3	5169.3		Upcast	5169.3	5169.3	5169.3	5169.3	5169.3	5169.3	5169.3	5169.3	5169.3		5169.3	1292.3
West Sunday No. 2	circular	5.3	5.3	3.4	22.3		3614.6		Upcast	3614.6	3614.6	3614.6	3614.6	3614.6		Upcast	3614.6	3614.6	3614.6	3614.6	3614.6	3614.6	3614.6	3614.6	3614.6		3614.6	903.6

b vent was switched to forced intake when canister was collected; therefore, no flow rate was measured. The average of other flow rates was used.

c At time of measurement, field records indicate that this was always an unforced vent that always had low flow. It was stagnant at this time; therefore, the flow rate from the previous month was assumed.

d no flow rates were obtained for January; therefore, an average of annual values was used.

